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IMPLEMENTATION PLAN REVIEW FOR COLORADO AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

TRW/Environmental Services

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16. ABSTRACT

Section IV of the Energy Supply and Environmental Coordination Act of 1974, (ESECA) requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interferring with the attainment and maintenance of the national ambient air quality standards. This document, which is also required by Section IV of ESECA, is EPA's report to the State indicating where regulations might be revised.

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IMPLEMENTATION PLAN REVIEW
FOR
COLORADO
REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

PREPARED BY THE FOLLOWING TASK FORCE:

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Denver, Colorado 80203

Environmental Services of TRW, Inc.
(Contract 68-02-1385)

U. S. Environmental Protection Agency
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

December 1974

COLORADO

ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT
(SECTION IV - STATE IMPLEMENTATION PLAN REVIEW)

Table of Contents

		Page
1.0	EXECUTIVE SUMMARY	1
2.0	STATE IMPLEMENTATION PLAN REVIEW	6
2.1	Summary	6
2.2	Air Quality Setting - State of Colorado	8
2.3	Background on the Development of the Current State Implementation Plan	10
2.4	Special Considerations - Colorado	11
3.0	CURRENT ASSESSMENT BASED ON SIP REVIEW	12
3.1	Regional Air Quality Assessment	12
3.2	Power Plant Assessments	12
3.3	Industrial/Commercial/Institutional Source Assessment	13
3.4	Area Source Assessment	13
3.5	Impact of Fuel Switching	13
	TECHNICAL APPENDICES	
	APPENDIX A - State Implementation Plan Background	15
	APPENDIX B - Regional Air Quality Assessment	29
	APPENDIX C - Power Plant Assessment	32
	APPENDIX D - Industrial/Commerical, Institutional Source Assessment	40
	APPENDIX E - Area Source Assessment	45
	APPENDIX F - Other Analyses	46
	BIBLIOGRAPHY	48

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1.0 EXECUTIVE SUMMARY

The enclosed report is the U. S. Environmental Protection Agency's (EPA) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). In addition to requiring that EPA report to the State on whether control regulations might be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the States. The States may, as in the Clean Air Act of 1970, initiate State Implementation Plan revisions; ESECA does not, however, require States to change any existing plan.

Congress has intended that this report provide the State with information on excessively restrictive control regulations. The intent of ESECA is that SIP's, wherever possible, be revised in the interest of conserving low sulfur fuels or converting sources which burn oil or natural gas to coal. EPA's objective in carrying out the SIP reviews, therefore, has been to try to establish if emissions from combustion sources may be increased. Where an indication can be found that emissions from certain fuel burning sources can be increased and still attain and maintain NAAQS, it may be plausible that fuel resource allocations can be altered for "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallel EPA's policy on clean fuels. The Clean Fuels Policy has consisted of reviewing implementation plans with regards to saving low sulfur fuels and, where the primary sulfur dioxide air quality standards were not exceeded, to encourage States to either defer compliance regulations or to revise the SO_2 emission regulations. The States have also been asked to discourage large scale shifts from coal to oil where this could be done without jeopardizing the attainment and maintenance of the NAAQS.

To date, EPA's fuels policy has addressed only those States with the largest clean fuels saving potential. Several of these States have or are currently in the process of revising SO_2 regulations. These States are generally in the Eastern half of the United States. ESECA, however, extends the analysis of potentially over-restrictive regulations to all 55 States and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

There are, in general, three predominant reasons for the existence of overly restrictive emission limitations within the State Implementation Plans. These are 1) The use of the example region approach in developing State-wide air quality control strategies; 2) the existence of State Air Quality Standards which are more stringent than NAAQS; and 3) the "hot spots" in only part of an Air Quality Control Region (AQCR) which have been used as the basis for controlling the entire region. Since each of these situations affect many State plans and in some instances conflict with current national energy concerns, a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal of the SIP's conducted in 1972. At that time SIP's were approved by EPA if they demonstrated the attainment of NAAQS or more stringent state air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a State to identify the most polluted air quality control region (AQCR) and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCR's of the State if the control regulations were applied to similar sources. The problem with the use of an example region is that it can result in excessive controls, especially in the utilization of clean fuels, for areas of the State where sources would not otherwise contribute to NAAQS violations. For instance, a control strategy based on a particular region or source can result in a regulation requiring 1 percent sulfur oil to be burned state-wide where the use of 3 percent sulfur coal would be adequate to attain NAAQS in some locations.

EPA anticipates that a number of States will use the review findings to assist them in making the decision whether or not to revise portions of their State Implementation Plans. However, it is most important for those States which desire to submit a revised plan to recognize the review's limitations. The findings of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent EPA's best judgment and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources were found, however, they were used in the analysis.

The data upon which the reports' findings are based is the most currently available to the Federal Government. However, EPA believes that the States possess the best information for developing revised plans. The States have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of air quality standards. Therefore, those States desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data supporting EPA's findings. In developing a suitable plan, it is suggested that States select control strategies which place emissions for fuel combustion sources into perspective with all sources of emissions such as smelters or other industrial processes. States are encouraged to consider the overall impact which the potential relaxation of overly restrictive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, NO_x, and HC emissions which occur in fuel switching, and other potential air pollution problems such as sulfates .

Although the enclosed analysis has attempted to address the attainment of all the NAAQS, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide (SO_2) emissions. This is because stationary fuel combustion sources constitute the greatest source of SO_2 emissions and are a major source of TSP emissions.

Part of each State's review was organized to provide an analysis of the SO_2 and TSP emission tolerances within each of the various AQCR's. The regional emission tolerance estimate is, in many cases, EPA's only measure of the "over-cleaning" accomplished by a SIP. The tolerance assessments have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for changing emission limitation regulations. In conjunction with the regional analysis, a summary of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendix C, D, and E.

- The Colorado State Implementation Plan has been reviewed for the most frequent causes of over-restrictive emission limiting regulation. Although Colorado used the Example Region approach in developing control strategies for both TSP and SO_2 and has TSP and SO_2 air quality standards which are more stringent than NAAQS, there are no indications that current regulations are overly restrictive in the context of Section IV of ESECA.

- SO_2 emission regulations for existing sources were recently withdrawn from the State Implementation Plan. The approval by EPA of Colorado's request to withdraw the regulation is an indication of EPA concurrance with findings that the current state regulation is more stringent than required to meet NAAQS for SO_2. Additionally, there were no areas proposed as designated AQMA's for SO_2 as of August 1974.

- There are indications of widespread TSP problems throughout the state of Colorado. All AQCR's in the state have reported violations of NAAQS for particulates. In addition, five of the eight Colorado AQCR's have been proposed as AQMA's for particulates, and three AQCR's (Metro Denver, Pawnee, and San Isabel) have had NAAQS attainment dates delayed until 1977. Wind-blown fugitive dust accounts for most of Colorado's TSP problem, however, there are significant emissions (>30%) from stationary fuel combustion sources in the Metro Denver, Pawnee, San Isabel, and Yampa AQCR's. Any increase in man-made TSP emissions would only aggravate the current high level of particulates. Therefore, the stationary source fuel combustion particulate emission regulation is not a good candidate for revision in any Colorado AQCR.

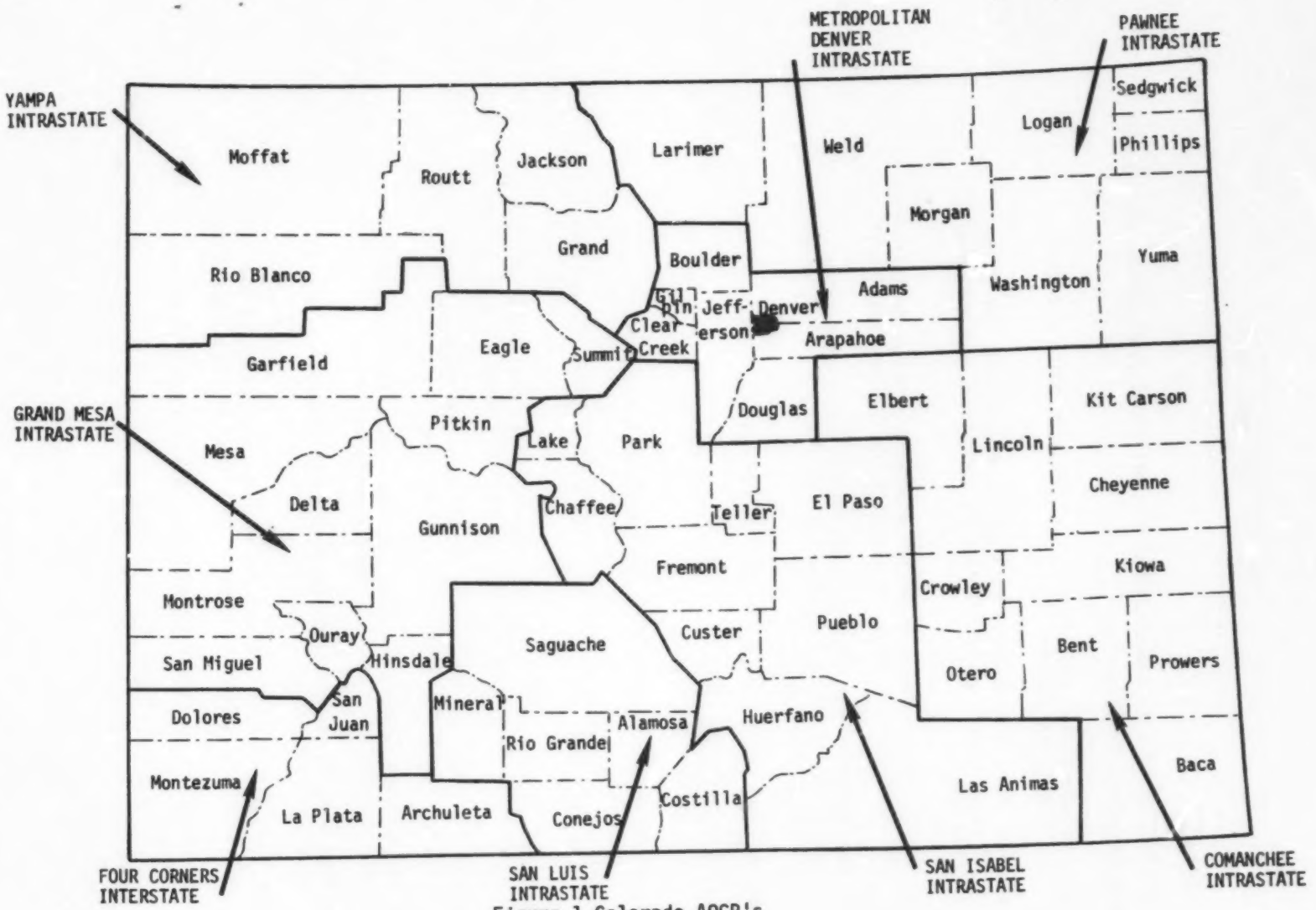

Figure 1-Colorado AQCR's

2.0 STATE IMPLEMENTATION PLAN REVIEW

2.1 Summary

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

- Does the State have air quality standards which are more stringent than NAAQS?
- Does the SIP have emission limiting regulations for control of existing (1) power plants, (2) industrial sources, and (3) area sources.
- Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?
- Has the State not initiated action to modify combustion sources emission regulations for fuel savings; i.e., under the Clean Fuels policy?
- Are there no proposed Air Quality Maintenance Areas?
- Are there indications of a sufficient number of monitoring sites within a region?
- Is there an expected 1975 attainment date for NAAQS?
- Based on reported (1973) Air Quality Data, does air quality meet NAAQS?
- Based on reported (1973) Air Quality Data, are there indications of a tolerance for increasing emissions?
- Are the total emissions from stationary fuel combustion sources lower than those of other sources?
- Do modeling results for specific fuel combustion sources show a potential for a regulation revision?
- Must emission regulations be revised to accomplish significant fuel switching?
- Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?
- Is there a significant Clean Fuels Saving potential in the region?

COLORADO

STATE IMPLEMENTATION PLAN REVIEW

(SUMMARY)

"INDICATORS"	STATE		Four Corners AQCR 14		Commanche AQCR 34		Grand Mesa AQCR 35		Metro Denver AQCR 36		Pawnee AQCR 37		San Isabel AQCR 38		San Luis AQCR 39		Yampa AQCR 40	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?	Yes	Yes																
• Does the SIP have emission limiting regulations for control of existing:																		
1. Power plants	Yes	No[a]																
2. Industrial sources	Yes	No																
3. Area sources	No	No																
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	Yes	Yes																
• Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?	Yes	No[a]																
• Are there no proposed Air Quality Maintenance Areas?			Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes
• Are there indications of a sufficient number of monitoring sites within a region?			Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	No
• Is there an expected 1975 attainment date for NAAQS?			Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes
• Based on reported (1973) Air Quality Data, does air quality meet NAAQS?			No	Yes	No	N/A	No	N/A	No	Yes	No	N/A	No	N/A	No	N/A	No	N/A
• Based on reported (1973) Air Quality Data, are there indications of a tolerance for increasing emissions?			Yes	No	No	N/A	No	N/A	No	Yes	No	N/A	No	N/A	No	N/A	No	N/A
• Are the total emissions from stationary fuel combustion sources lower than those of other sources?			No	No	Yes	No	Yes	No	Yes	No	No	No	Yes	No	No	No	No	No
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
• Must emission regulations be revised to accomplish significant fuel switching?			Yes	No[a]	Yes	No[a]	Yes	No[a]	Yes	No[a]	Yes	No[a]	Yes	No[a]	Yes	No[a]	Yes	No[a]
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?			Marginal	a	Poor	a	Poor	a	Poor	a	Poor	a	Poor	a	Poor	a	Poor	a
• Is there a significant Clean Fuels Saving potential in the region?			No		No		No		No		No		No		No		No	

[a]Present state regulation has been withdrawn from SIP and public hearings are being held to consider revisions.

The following portion of this report is directed at answering these questions. An AQCR's potential for revising regulations increases when there are affirmative responses to the above.

The initial part of the SIP review report, Section 2 and Appendix A, was organized to provide the background and current situation information for the State Implementation Plan. Section 3 and the remaining Appendices provide an AQCR analysis which helps establish the overall potential for revising regulations. Emission tolerance estimates have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for revising emission limiting regulations. In conjunction with the regional analysis, a characterization of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendix C, D, E.

Based on an overall evaluation of EPA's current information, AQCR's have been classified as good, marginal, or poor candidates for regulation revisions. The following table summarizes the State Implementation Plan Review. The remaining portion of the report support this summary with explanations.

2.2 AIR QUALITY SETTING - STATE OF COLORADO

The State of Colorado was divided into eight air-quality control regions - AQCR. They are as follows:

14 Four Corners interstate air quality control region
34 Comanche intrastate air quality control region
35 Grand-Mesa intrastate air quality control region
36 Metropolitan Denver intrastate air quality control region
37 Pawnee intrastate air quality control region
38 San Isabel intrastate air quality control region
39 San Luis intrastate air quality control region
40 The Yampa intrastate air quality control region

See Figure A-1.

A summary of the Federal and Colorado air quality standards for the pollutants under study is presented in Table A-3. The Colorado standard for particulate parallels the federal standard. The Colorado particulate

standard is based on an annual geometric mean. The Colorado air quality standard for SO_2 is more stringent than the federal SO_2 standard. Colorado does not have an existing ambient standard for NO_2.

Colorado has an extensive monitoring network for suspended particulate matter. The network consists of 75 stations located throughout the state. The distribution of the monitoring sites parallels the distribution of the population in the state. Almost a third of the sites are in the Metropolitan Denver AQCR, which contains approximately half of the state's population. Remaining sites are distributed throughout the state with the Comanche AQCR having the least number of sites (two). Ambient monitoring of SO_2 is limited within the State of Colorado. According to the most recent NEDS information, the State of Colorado has two monitoring sites located in the Metro Denver AQCR. The remaining seven AQCR's in Colorado are not currently being monitored for SO_2 ambient concentration.

Summaries of Colorado air quality status in 1973 are presented in Table A-4 for particulates and A-5 for SO_2. The number of stations exceeding standards are presented by air quality control regions (AQCR). The highest particulate readings in the state are in the Metro Denver AQCR. Five of the eight Colorado AQCR's violated the primary annual and 24-hour standards for particulates in 1973. All AQCR's violated the secondary standards for both annual average and 24-hour levels.

Colorado has three priority one AQCR's for TSP. They are Metro Denver (36), Pawnee (37), and San Isabel (38). At the time of submitting the Colorado State Implementation Plan the State was able to demonstrate attainment of the primary standard by July 1974. The attainment data for secondary standards in those three AQCR's has been deferred 18 months. Additional studies by both EPA and Colorado have demonstrated the possibility of attaining primary standards for particulate in the Pawnee and San Isabel AQCR's by 1975. For the Metro Denver AQCR, however, the probability of 1975 primary standard attainment is very remote. Additionally, even with the incorporation of strict fugitive dust regulations "it is still doubtful that the secondary standards will be achieved in the three AQCR's. The major problems in achieving the standards are the large contribution of fugitive dust total particulate

emissions in the regions and the low control efficiencies attainable for most fugitive dust sources."[1]

A summary of SO_2 emissions is presented in Table A-5 by AQCR totals. The summaries were prepared from the most current data available.[2] There has been insufficient monitoring to evaluate ambient SO_2 levels in all regions of Colorado except Metro Denver.

2.3 BACKGROUND OF THE DEVELOPMENT OF THE CURRENT STATE IMPLEMENTATION PLAN

The State Implementation Plan control strategy and regulations were based on the example region approach. Metropolitan Denver (AQCR 36) was used as the example region. The control strategies and regulations as submitted by the State were adequate to attain the national standard for particulates in the Denver AQCR. The other regions violating the total particulate standards were presumed to meet the National Ambient Air Quality Standards by 1975 using the same strategies proposed for the example region.

The State regulation for the control of particulate matter includes a schedule of emissions from fuel combustion sources based on total heat input in 10^6 Btu's, in addition to 20% opacity standard for stationary sources. These regulations apply to existing sources. The federal New Source Performance Standards will be applicable for new sources. The state has adopted fugitive dust emissions regulations from unpaved roads, earth and construction material moving and excavating, and open mining types of operations. There are no EPA enforceable SO_2 regulations applicable to existing sources since the emission standards were recently withdrawn from the state implementation plan by EPA at the request of the state. The state is currently holding public hearings on its present SO_2 regulations to determine if modification or elimination is appropriate. In any case, the approval by EPA of Colorado's request to withdraw the stringent existing source SO_2 regulation from the SIP is an indication of EPA concurrance with findings that the present regulation is more restrictive than required to meet NAAQS for SO_2. Since this study is a review of the state implementation plan, the following analyses

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[1] "Colorado Fugitive Dust Investigation" by PEDCO Environmental of Cincinnati Ohio, under contract of the Environmental Protection Agency.

[2] 1974 NEDS, July 28, 1974

will proceed as if there were no SO_2 regulations for existing sources in the state. New source regulations remain in force. A summary of Colorado fuel combustion regulations may be found in Table A-11.

Colorado does not have regulations controlling NO_2 emissions.

2.4 SPECIAL CONSIDERATION - COLORADO

Portions of five AQCR's within the state have been proposed as designated air quality maintenance areas (Table A-1). It is anticipated that special requirements for these areas will be developed by the state and submitted to EPA as modifications to the Implementation Plan. Virtually all major present and planned fuel combustion sources are located in the counties where portions of AQCR's are proposed as designated AQMA's.

Energy Supply Potential

There is an estimated 500 to 600 billion barrels of oil in the oil shale deposits of the Green River formation of the Rocky Mountains. The richest deposits are in the Colorado Piceance Creek Basin. For years the resources have been bypassed in favor of more easily extracted fossil fuels. Two parcels (approximately 5000 acres each) were leased by the Federal government to encourage oil shale development. Successful operations on the leased tracks should produce 50,000 BPD (barrels per day) of crude oil from each lease by 1980. If the oil (kerogen) extraction process proves to be economically viable, the Federal Energy Administration (FEA) has projected a 1990 minimum development potential of 550 thousand barrels per day for Colorado.

The nearest term energy resource in Colorado is coal. Colorado has two major deposits of low sulfur bituminous coal. Again, the largest is in the Piceance Basin in western Colorado, with the other in northeastern Colorado. A smaller deposit is located on the Southern border of Colorado. The eastern reserves of coal in Colorado may be developed using a coal gasification process. The Metro Denver AQCR is scheduled to have a 250 million scf/d coal gasification plant on line before 1985.

In 1971, Colorado had 41 coal mines, 32 underground and 9 above (strip mine). Those mines produced $33.8 million in revenue. With the resurgence of coal as a source for domestic power needs, it is expected that extensive coal development will occur.

3.0 CURRENT ASSESSMENT BASED ON SIP REVIEWS

3.1 REGIONAL AIR QUALITY ASSESSMENTS

The only sites in the state that monitor SO_2 (Metro Denver AQCR), indicate levels well below standards. This was the justification for withdrawal from the SIP of SO_2 emission regulations from existing sources.

Tables A-7 and A-8 present the emission summaries for Colorado. They indicate a significant fraction (30%+) of total suspended particulates come from electrical generation and point source fuel combustion in all but 3 AQCR's. The majority of particulate emissions come from fugitive dust sources. Fuel combustion sources are the major contributors to total SO_2 emissions on a statewide basis.

Table A-9 and A-10 present the results of estimating what the Colorado emissions would be on a region wide basis. The largest drawback for using this approach lies in the large geographical dispersion of emission sources in the Colorado AQCR's. The analysis is intended to give an "indication" of potential areas for relaxation.

Tables B-1 and B-2 summarize the general data for each pollutant by AQCR that must be considered when estimating the potential for regulation relaxation. The analysis was performed to determine if there were any obvious combustion source candidates. There is no indication from available data that regulations are too stringent in any region.

3.2 POWER PLANT ASSESSMENTS

At the present time there are 14 power plant sites in the state. All AQCR's have at least one power plant. Pawnee (AQCR 37) has two; Metro Denver and San Isabel AQCR's have four each (Table A-6).

Two power plants in the State of Colorado are 100% coal fired. The first is the Hayden Power Plant (AQCR 40); the other is the Nucla Power Plant (AQCR 35). Eight power plants in Colorado are partially coal-fired, with a mixture of other fuels. The remaining four power plants use only oil or natural gas as fuel, with no possibility of conversion. Table C-1 presents relevant data on all power plants presently in operation in Colorado.

All plants are on compliance schedules to meet emission regulations. Coincidentally, power plants in those three AQCR's now projected to have difficulty in meeting the primary standards, generally exceed total suspended particulate allowable emissions.

Table C-2 lists all known projected power plants (1974 thru 1985). These are large coal fired installations. Many of these plants are to be located adjacent to the coal source.

Table C-3 lists the energy development related power plants. The first is a coal gasification plant that is slated for development sometime between 1975 and 1985 in the Metro Denver AQCR. The lower portion of the table gives estimates of the kind of generating facility that would be required to support the operation of a 50,000 barrel-per-day oil shale development plant.

3.3 INDUSTRIAL/COMMERCIAL/INSTITUTIONAL SOURCE ASSESSMENT

All major stationary fuel combustion sources in the State of Colorado were reviewed. Thirty-one of those sources presently do not use coal or do not have the apparent capability to switch to coal. The remaining three stationary fuel combustion sources are located in the Denver AQCR. Since that AQCR has been demonstrated as being unable to meet the primary particulate standard in 1975, and those three sources are not significant, additional analysis was not performed.

3.4 AREA SOURCE ASSESSMENT

The State of Colorado was found to have no area sources which could be evaluated within the context of Section 4 of ESECA.

3.5 IMPACT OF FUEL SWITCHING

An analysis of fuel combustion sources was made to determine the feasibility of conversion to coal and its resulting impacts on emissions and regulations. The candidate sources for fuel switching identified in Appendix C were evaluated to determine the potential for relaxation of regulations. The percentage of coal utilized was estimated by translating all fuel used into total annual heat input and directly proportioning on the basis of the

percent of annual heat input contributed by each fuel type. The emissions resulting from conversion to coal at these candidate combustion sources were estimated and compared to current emissions (Appendix F-1).

Table F-1 presents the power plant present and potential emissions based on 100% coal utilization with present control equipment. All power plants would not meet current particulate emission regulations without additional controls.

In general, the analysis indicated that for total suspended particulates, the increase in projected emissions with fuel conversion will be significant. Ambient air quality standards will probably not be met. Consequently, further relaxation of regulations should not take place. The analysis indicated that fuel switching will further aggravate the particulate compliance problem in the Denver, Pawnee and San Isabel AQCR's. There are indications that the TSP Air Quality standards may not be met even if all sources comply with present regulations because many sources presently emit well under requirements. Relaxation of the regulation in these regions would probably put the compliance goal out of reach. Without sufficient monitoring data, it is impossible to assess the impact of the fuel switching on the ambient levels of SO_2.

APPENDIX A

- State implementation plan information
- Current air quality information
- Current emissions information

Tables in this appendix summarize original and modified state implementation plan information, including original priority classifications, attainment dates, ambient air quality standards, and fuel combustion emission regulations. SAROAD data for SO_2 and TSP monitoring stations are shown for AQCR's in the state. NEDS emissions data by AQCR[1] are tabulated and broken down into fuel burning categories.

Tables A-9 and A-10 show a comparison of emission inventories in the original SIP and those from the NEDS. An emission tolerance, or emission tonnage which might be allowed in the AQCR and still not violate national secondary ambient air quality standards, is shown for SO_2 and particulates. The intent of this calculation is to indicate possible candidate regions for fuel switching. Tolerance was based on either the degree of control expected by the SIP or upon air quality/emission relationships which are calculated from more recent data. The value of the emission tolerance provides an indication of the degree of potential an AQCR possesses for fuel revisions and regulation relaxation.

Methodology for Increased Emissions Tolerance

A tolerance for increased emissions was determined as follows. First, an "allowable emissions" was calculated for each AQCR based on the current NEDS data and the percent reduction (or increase) required to meet the national secondary ambient air quality standards in that AQCR (worst case from Tables A-4 and A-5). This "allowable" was then compared to that from the SIP. If reasonable agreement occurred, then the "estimated emissions" which would result after implementation of the SIP in that AQCR were used to calculate an emissions tolerance. Thus, some credit could be given to an AQCR which might be restricting emissions more than required by ambient air quality standards. For instance, emission controls applied to AQCR's

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[1] "1972 National Emissions Report," EPA - 450/2-74-012, June 1974.

other than the example region for the state may reduce emissions well below "allowables." In the event that no data existed or was available from the SIP for an AQCR, the current air quality was used to assign emissions tolerance based on proportional rollback or rollup. Current air quality was also the criteria, if emissions data from SIP and NEDS did not appear to be comparable (this is often the case).

When no SIP emissions data was available, and current air quality levels were less than one half of the level represented by an ambient air quality standard, no "rollup" emissions tolerance was calculated in Tables A-9 and A-10. This arbitrary cutoff point was chosen so as not to distort the emissions tolerance for an area. At low levels of a pollutant, the relationship between emissions and air quality is probably not linear. Although this cutoff may leave some AQCRs with no quantifiable emissions tolerance, it was felt that no number at all would be preferable to a bad or misleading number.

It is emphasized that emissions tolerance is a region-wide calculation. This tolerance obviously makes more sense in, say, an urban AQCR with many closely spaced emissions sources than in a largely rural AQCR with geographically dispursed emissions.

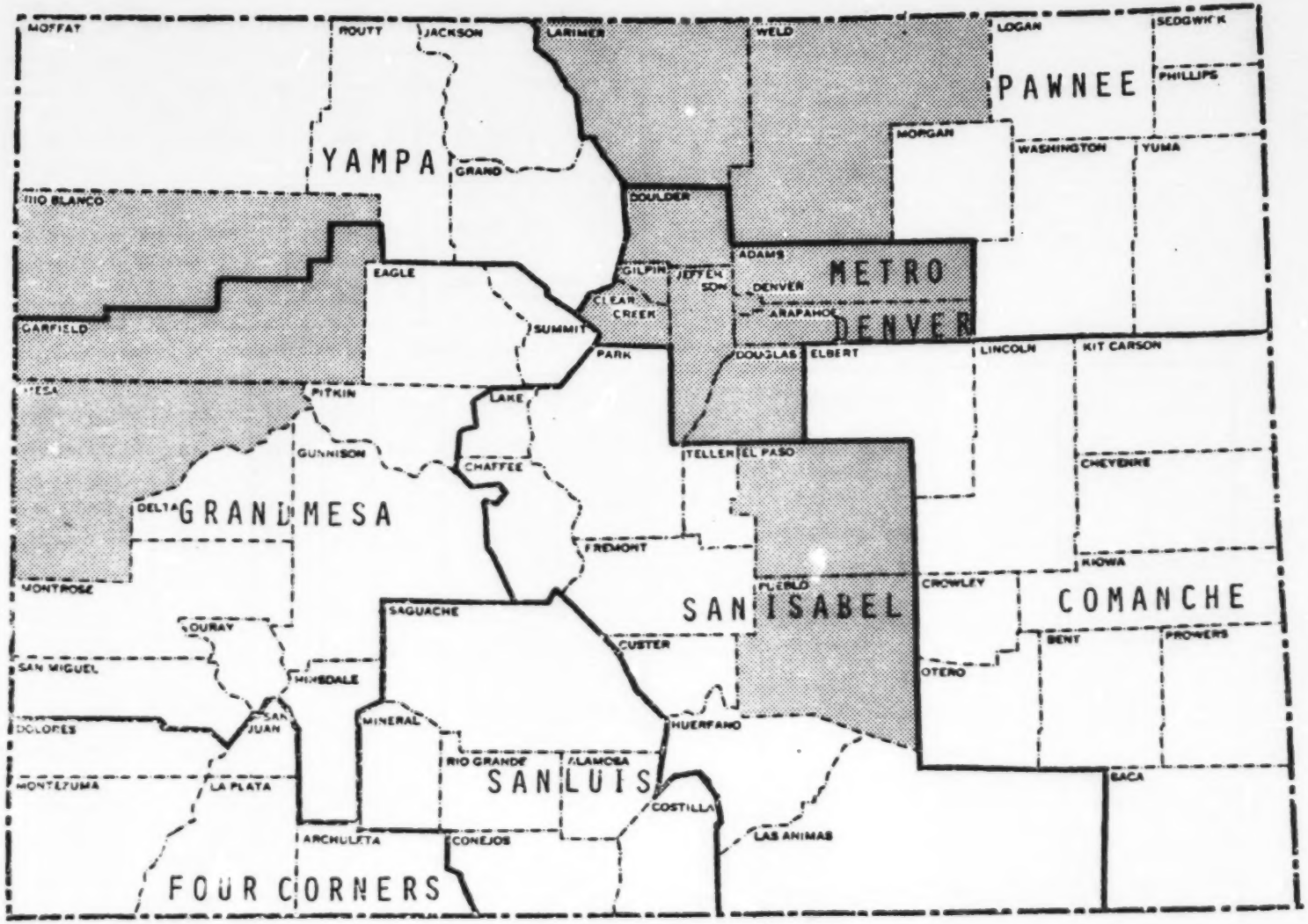
Table A-1. AQCR Priority Classification and AQMAs

AQCR	Fed. #	Part.[a]	SO_x[b]	NO_x[c]	Demographic Information Population 1970	Square Miles	Population Density	AQMA Designations[d] TSP Counties	SO_x Counties	NO_x Counties
Four Corners (Ariz,Utah, Colo,N.Mex)	014	IA	IA	III	368,310	109,101	3.38			
Colorado Portion		IA	IA	III	37,356	6,558	5.70			
Comanche	034	III	III	III	72,728	17,926	4.06			
Grand Mesa	035	III	III	III	130,470	19,045	6.85	(2) Garfield, Mesa		
Metro Denver	036	I	III	III	1,242,027	5,045	246.19	(8) Adams, Arapahoe,Boulder, Clear Creek, Denver,Douglas, Gilpin,Jefferson		(8) Adams, Arapahoe,Boulder, Clear Creek, Denver,Douglas, Gilpin,Jefferson
Pawnee	037	I	III	III	239,784	15,842	15.14	(2) Larimer,Weld		
San Isabel	038	I	III	III	423,551	17,360	24.40	(2) Pueblo, El Paso		
San Luis	039	III	III	III	37,466	8,180	4.58			
Yampa	040	III	III	III	23,877	13,812	1.73	(1) Rio Blanco		

Criteria Based on Maximum Measured (or Estimated) Pollution Concentration in Area

Priority	I	II	III
	Greater than	From - To	Less than
[a]Particulate matter:			
Annual geometric mean...	95	60-90	60
24-hour maximum.....	325	150-325	150
[b]Sulfur oxide:			
Annual arithmetic mean..	100	60-100	60
24-hour maximum	455	260-455	260
[c]Nitrogen dioxide	110		110

[d]Federal Register, August 1974, SMSA's showing potential for NAAQS violations due to growth



Proposed AQMA's

COLORADO AIR QUALITY CONTROL REGIONS

Figure 1

Table A-2. Attainment Dates[b]

AQCR #	Name	Particulates Attainment Dates		Sulfur Dioxide Attainment Dates		Nitrogen Oxides Attainment Dates
		Primary	Secondary	Primary	Secondary	
14	Four Corners	7/75	7/75	a	a	a
34	Comanche	a	a	a	a	a
35	Grand Mesa	7/75	7/75	a	a	a
36	Metro Denver	7/75	b	a	a	a
37	Pawnee	7/75	b	a	a	a
38	San Isabel	7/75	b	a	a	a
39	San Luis	a	7/75	a	a	a
40	Yampa	a	a	a	a	a

[a] air quality presently below standards

[b] 18 months extension granted

Table A-3. Ambient Air Quality Standards Colorado Expressed as $\mu g/m^3$

		Total Suspended Particulate		Sulfur Oxides				Nitrogen Dioxide
		Annual	24 hr.	Annual	24 hr.	3 hr.	1 hr.	
Federal[1] (Nov. 1972)	Primary	75(G)	260[a]	80(A)	365[a]	----	----	100(A)
	Secondary	60(G)	150[a]	----	----	1300[a]	----	100(A)
State	Designated area (Metro Denver, other state designated areas)							
	1973 Standards	70(A)	200	60(A)	300[a]	----	800[a]	
	1976 Standards	55(A)	180	25(A)	150[a]	----	300[b]	
	Non-designated area							
	1973 Standards	45(A)	150	----	15[a]	----	----	

[1]Federal regulations apply

(G)Geometric mean

(A)Arithmetic mean

[a]not to be exceeded more than once per year

[b]not to be exceeded more than once per month

Table A-4. Colorado AQCR Air Quality Status, TSP[a]

AQCR Name	AQCR #	# Stations Reporting	TSP Concentration ($\mu g/m^3$) Highest Reading Annual	Highest Reading 24-Hr	2nd Highest Reading 24-Hr	# Stations Exceeding Ambient Air Quality Standards Primary Annual	Primary 24-Hr[c]	Secondary Annual	Secondary Annual %	Secondary 24-Hr[c]	Secondary 24-Hr %	% Reduction Required to Meet Standards[d]	Standard on Which % Reduction Is Based
Four Corners[b] (Utah, Colo, Ariz, N.Mex)	014	23	65	430	374	0	1	1	4	8	35	60	24-hr Secondary Standard
Colorado Portion		6	65	234	189	0	1	1	17	2	33	21	
Comanche	034	2	66	217	197	0	0	1	50	2	100	24	
Grand Mesa	035	10	93	339	291	3	4	4	40	9	90	48	
Metro Denver	036	24	129	930	587	15	18	18	75	24	100	74	
Pawnee	037	13	113	415	413	8	9	9	69	11	85	64	
San Isabel	038	11	109	469	371	5	5	7	64	9	82	60	
San Luis	039	5	71	227	187	0	0	1	20	3	60	20	
Yampa	040	4	108	469	348	1	1	3	75	3	75	57	

[a] 1973 air quality in National Air Data Bank as of July 28, 1974

[b] Interstate

[c] Violations based on more than one reading in excess of standards

[d] Formula: $\frac{\text{2nd highest 24-hr} - \text{Secondary 24-hr standard}}{\text{2nd highest 24-hr.}}$

Table A-5. Colorado AQCR Air Quality Status, SO_2[a]

AQCR Name	AQCR #	# Stations Reporting 24-Hr (Bubbler)	# Stations Reporting (Contin.)	SO_2 Concentration ($\mu g/m^3$) Highest Reading Annual	Highest Reading 24-Hr	2nd Highest Reading 24-Hr	# Stations Exceeding Ambient Air Quality Std. Primary Annual	Primary 24-Hr[c]	Secondary 3-Hr	% Reduction[d] Required To Meet Standards	Standard on Which % Reduction Is Based
Four Corners[b] (Ariz,Utah, Colo,N.Mex)	014	9	4	2	79[e]	28[e]	0	1	0	presently meets stds.	
Colorado		0	0	0	0	0	0	0	0	0	
Comanche	034	0	0	0	0	0	0	0	0	0	
Grand Mesa	035	0	0	0	0	0	0	0	0	0	
Metro Denver	036	2	7	NDA	308	53	0	0	0	presently meets stds	
Pawnee	037	0	0	0	0	0	0	0	0	0	
San Isabel	038	0	0	0	0	0	0	0	0	0	
San Luis	039	0	0	0	0	0	0	0	0	0	
Yampa	040	0	0	0	0	0	0	0	0	0	

[a]1973 air quality in National Air Data Bank as of July 28, 1974

[b]Interstate

[c]Violations based on more than one reading in excess of standards

[d]Formula: $\frac{\text{2nd highest 24-hr-Secondary 24-hr standard}}{\text{2nd highest 24-hr.}}$

[e]Measurements confirmed by EPA, Region VI, October 24, 1974

Table A-6. Colorado Fuel Combustion Source Summary[a]

AQCR	AQCR #	Colorado Power Plants NEDS[b]	Colorado Power Plants FPC[c]	Other Fuel Combustion Point Sources[b] Particulate	Other Fuel Combustion Point Sources[b] SO_2
Four Corners (Colorado)	014	0	0	1	1
Comanche	034	1	0	4	1
Grand Mesa	035	2	2	1	1
Metro Denver	036	4	4	25	22
Pawnee	037	1	0	10	6
San Isabel	038	4	3	7	6
San Luis	039	1	0	0	0
Yampa	040	1	0	0	0

[a]Only sources in Colorado are included

[b]All sources from National Emission Data Bank Point Source listing as of June 17, 1974

[c]Federal Power Commission information for 1973 of major power plants

Table A-7. Colorado Emissions Summary, TSP[a]

AQCR	AQCR #	Total Tons/Year	Percent Fuel Combustion	Electricity Generation Tons/Year	Electricity Generation %	Point Source Fuel Combstion Tons/Year	Point Source Fuel Combstion %	Area Source Fuel Combustion Tons/Year	Area Source Fuel Combustion %
Four Corners	014	37.7	79.2	27.6	72.6	0.10	0.3	2.4	6.3
Colorado[b]		1.6	29.62	0	0	.03	.02	.46	29.6
Comanche	034	1.8	15.0	0	0	0.02	1.1	0.25	13.9
Grand Mesa	035	8.0	26.63	0.12	1.5	0.01	0.13	2.0	25
Metro Denver	036	39.3	49.1	8.7	22.1	1.8	4.6	8.8	22.4
Pawnee	037	11.6	49.9	0.5	4.3	4.1	35.3	1.2	10.3
San Isabel	038	149.0	3.05	0.95	0.64	0.76	0.51	2.9	1.9
San Luis	039	0.42	59.6	0.02	4.8	0	0	0.23	54.8
Yampa	040	10.4	96.4	9.5	91.3	0	0	0.53	5.1

[a]Emissions in Data Bank as of June 1974

[b]Colorado Portion of AQCR 014 only

Table A-8. Colorado Emissions Summary, SO_2[a]

AQCR		Total 10^3 Tons/Year	Percent Fuel Combustion	Electricity Generation 10^3 tons/yr	Electricity Generation %	Point Source Fuel Combustion 10^3 tons/yr	Point Source Fuel Combustion %	Area Source Fuel Combustion 10^3 tons/yr	Area Source Fuel Combustion %
Four Corners	014	119.4	93.74	110.5	92.5	0.17	0.14	1.31	1.1
Colorado[b]		.4	78.1	0	0	.002	4.5	.32	73.6
Comanche	034	0.45	42.2	0.01	2.2	0	0	0.18	40.0
Grand Mesa	035	2.9	85.5	0.95	32.8	0.03	1.0	1.5	51.7
Metro Denver	036	33.5	50.1	11.5	34.3	0.90	2.7	4.4	13.1
Pawnee	037	2.3	71.7	0.07	3.0	0.83	36.1	0.75	32.6
San Isabel	038	8.8	61.0	3.0	34.1	0.56	6.4	1.8	20.5
San Luis	039	0.40	60.0	0.15	37.5	0	0	0.13	32.5
Yampa	040	5.3	98.3	4.8	90.6	0	0	0.41	7.7

[a]Emissions in Data Bank as of June 1974

[b]Data not available

Table A-9. Required Emission Reductions

	SIP					1973 Data				
AQCR	AQ Meas.	% Red.[a]	Emissions (10^3 tons)	Allowable Emissions[b] (10^3 tons)	1975[c] Estimated Emissions After Controls (10^3 tons)	AQ Meas.	% Red.[a]	NEDS Emissions (10^3 tons)	Allowable Emissions (10^3 tons)	Emission Tolerance (10^3 tons)
Four Corners 014						65	+28	37.7	48.3	10.6
(Colorado)	85	15	.151	.128		65	+28	1.6	2.05	.45
Comanche 034	57	+66	.033	.054		66	+25	1.8	2.25	.45
Grand Mesa 035	118	55	1.15	.518		93	34	8.0	5.28	0
Metro Denver 036	122	51	13.4	6.57	6.15	129	55	39.3	17.8	0
Pawnee 037	100	36	2.15	1.38		113	46	11.6	6.26	0
San Isabel 038	137	58	3.0	1.26		109	43	149.0	84.9	0
San Luis 039	NDA		.042			71	+13	0.42	.47	.05
Yampa 040	NDA		2.44			108	48	10.4	5.41	0

[a]background 30 $\mu g/m^3$ in regions 014, 034, 036, 037, 038; background 40 $\mu g/m^3$ in regions 035, 039, 040

[b]not calculated in SIP, calculated and presented for comparison

[c]calculated only for example region

Table A-10. Colorado Required Emission Reductions, SO_2

	SIP				1973 Data			
AQCR	AQ 24-hr Msrmt. Control Value	Emissions (10^3 tons)	Allowable Emissions (10^3 tons)	197_ Estimated Emissions After Controls (10^3 tons)	Percent Reduction Required Based On 1973 AQ Data	NEDS Emissions (10^3 tons)	Allowable Emissions[c] (10^3 tons)	Emission Tolerance (10^3 tons)
Four Corners								
014	-	-	-	-	91	119.4	108	0
(Colorado)	ND[a]	.15	-	-	ND	.4	NC[d]	-
Comanche								
034	ND	.03	-	-	ND	.45	NC	-
Grand Mesa								
035	ND	1.15	-	-	ND	2.9	NC	-
Metro Denver								
036	99	20.1	54.0	NA[b]	increase	33.5	125	91.5
Pawnee								
037	ND	2.15	-	-	ND	2.3	NC	-
San Isabel								
038	ND	3.0	-	-	ND	8.8	NC	-
San Luis								
039	ND	.04	-	-	ND	0.40	-	-
Yampa								
040	ND	2.44	-	-	ND	5.3	-	-

[a] no data available

[b] not required in SIP, so not calculated

[c] SO_2 emission regulation for existing sources withdrawn

[d] not calculatable

Table A-11. Colorado Fuel Combustion Regulations

	Existing Sources		New Sources
Particulate	Fuel Input 10^6 BTU/hr	Particulate Emissions Lbs/10^6 BTU	New Source Performance Standards
	0.1	0.5	
	1.0	0.5	
	10.0	0.27	
	100.0	0.15	
	500.0	0.10	
	1000.0	0.10	
SO_2	Regulations for existing sources withdrawn fromSIP, see Federal Register, October 18, 1974[a]		Emission rate not greater than 5 T/day, shall not exceed 150 ppm stack concentration. Uncontrolled emissions greater than 5 T/day, controlled to less than 5 T/day, shall not exceed 500 ppm stack emission concentration.
Opacity	20% not to be exceeded more than 3 minutes in any 60 consecutive minutes		

[a] State currently holding public hearings on present SO_2 regulation. Until completed, present regulation can be enforced by state, withdrawal of regulation from SIP precludes EPA enforcement action.

APPENDIX B

Tables B-1 and B-2 are the assessment of AQCR's which should be examined for the fuel switching impact on particulate and SO_2 emissions. They also provide an identification of those AQCR's which show little potential for fuel revision or regulation relaxation if ambient air standards are to be attained.

Those AQCR's designated "high" or "medium" here will be examined in later appendices where an attempt will be made to estimate the emissions resulting from an assumed fuel schedule different from the present, or the emissions which might result if all fuel burning sources emitted up to their "allowables."

The criteria for candidates are:(1) the severity and breadth of air quality violations, (2) the tolerance for emissions increased in the AQCR, (3) the fraction of total emissions resulting from fuel combustion, and (4) AQMA designations. It should be noted that an AQCR may not necessarily need relaxation of regulations in order to accomplish fuel switching. Further, a good candidate in Tables B-1 and B-2 may later show little potential for fuel switching after individual sources are examined. Finally, it is posssible that an AQCR may have air quality levels below standard at present and may require more <u>strict</u> regulations than currently exist if all fuel burning sources were converted to dirtier fuels, i.e., "average" emission rate now may be below "average" regulations.

B-1. Candidacy Assessment for Relaxation of TSP Regulations

AQCR	Air Quality # Monitors	Air Quality # Violations	Expected Attainment Date	Any Counties AQMA Designations?	% Emission from Fuel Combustion	Tolerance for Emissions Increase (10^3 tons)	Overall Regional Evaluation
014	23	8	7/75 (7/75)		79.2	10.6	Marginal
Colorado	6	2	7/75 (7/75)	0	29.62	.45	Poor
034	2	2	a (a)	0	15.0	.45	Poor
035	10	9	7/75 (7/75)	2	26.63	0	Poor
036	24	24	7/75 (b)	8	49.1	0	Poor
037	13	11	7/75 (b)	2	49.9	0	Poor
038	11	9	7/75 (b)	2	3.05	0	Poor
039	5	3	a (7/75)	0	59.6	.05	Poor
040	4	3	a (a)	1	96.4	0	Poor

[a]Air quality below standards

[b]18 months extension

B-2. Candidacy Assessment for Relaxation of SO_2 Regulations

AQCR		1973 Violations of SO_2 Air Quality Standards # monitors	#violations	Expected Attainment Dates Primary (Secondary)	Any Counties With AQMA SO_2 Designations	% Emission from Fuel Combustion	1973[b] Tolerance for Emissions Increase	Overall Regional Evaluation
Four Corners	014	13	1			93.74	0	Marginal
Colorado	0	0	0	a	0	78.1	-	-
Comanche	034	0	0	a	0	42.2	-	-
Grand Mesa	035	0	0	a	0	85.5	-	-
Metro Denver	036	0	0	a	0	50.1	91.5	Good
Pawnee	037	0	0	a	0	71.7	-	-
San Isabel	038	0	0	a	0	61.0	-	-
San Luis	039	0	0	a	0	60.0	-	-
Yampa	040	0	0	a	0	98.3	-	-

[a]presently meets standards

[b]SO_2 emission regulations for existing sources withdrawn

APPENDIX C

This section is a review of individual power plants by AQCR. The intent is to illustrate fuel switching possibilities and particulate and SO_2 emissions resulting from these switches on an individual plant basis. The total AQCR emissions resulting from such switches is then calculated.

Current power plant information used to prepare Table C-1 were obtained from three main sources: (1) Federal Power Commission computerized listings of power plants and their associated fuel use, (2) the National Coal Association "Steam Tables" listing of power plants and fuel use in 1972, and (3) NEDS Emissions data.[1] For those plants listed by the FPC (1 above), the 1973 fuel schedule was assumed, otherwise, fuel use is for 1972. Heat inputs are those based on actual fuel values where known, and average values shown in Table C-4 were used where not known. SO_2 and particulates emissions are those associated with the fuel use shown. In the case of particulates, emissions were calculated using NEDS emissions factors applied to the listed fuel schedule (in both tonnage and lbs/10^6 Btu). When a plant was not listed in NEDS, AP 42 emission factors were used to estimate SO_2 and TSP emissions (see Table C-4).

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[1] NEDS Data Bank 1974

C-1 A Colorado Power Plant Evaluation[a]

AQCR/Number/County	Plant/ Capacity	Fuel Type	Fuel Amount 10^3ton/yr	Fuel Heat Input 10^6BTU H	Emissions Tons/yr SO_2 Exist	SO_2 Allow	TSP Exist	TSP Allow
Comanche[b] 034 (Otero)	Comanche[c] 350	Oil 0.3% S 0 % A	398,000 gallons	150 per 1,000 gal	9	-	2	4.5
		Gas	1 MCF	862	<1		-	<1
Grand Mesa 035 (Montrose)	Nucla 34.5	Coal .67% S 1.5% A	65.5	121	115	-	834	673
Grand Mesa 035 (Mesa)	Cameo #1 77.4	gas	146 MCF	830	<1	-	<1	7.9
	Cameo #2	oil 0.5% S 0 % A	1,000,000 gallons	140 per 1000 gals	40	-	<1	10
	Cameo #3	gas	291 MCF	830	<1	-	<1	12
	Cameo #4	oil 0.5% S	2,190,000 gallons	140 per 1000 gals	79	-	2	15
Metro Denver 036 (Boulder)	Valmont #1 281.8	Coal .75% S 8.3% A	386 6,610	21	5500	-	6350	405
		gas	MCF	815	2		12	269
	Valmont #2	Coal .75% S 8.3% A	.213	21	3	-	15	<1
		gas	300 MCF	815	<1		2	13
	Valmont #3	Coal .75% S 8.3% A	22.3	21	317	-	1200	23
		gas	1160 MCF	815	<1	-	9	47

[a]Emissions in Data Bank as of June 1974.

[b]NEDs shows this plant in OTERO County-actually located in Pubelo County (San Isalue AQCR)

[c]Comanche 2 has recently gone on line and is coal fired.

C-1 B Colorado Power Plant Evaluation[a]

AQCR/Number/County	Plant/ Capacity	Fuel Type	Fuel Amount 10^3ton/yr	Fuel Heat Input 10^6BTU H	Emissions Tons/yr SO_2 Exist	SO_2 Allow	TSP Exist	TSP Allow
Metro Denver 036 (Denver)	Cherokee #1 801.3	Coal .53 8.8% A	37	22	373	-	189	41
		gas	780 MCF	850	< 1		< 1	33
	Cherokee #2	Coal .53% S 8.3% A	37	22	373	-	63	41
		gas	780 MCF	850	< 1	-	< 1	33
	Cherokee #3	Coal .53 % S 8.0% A	49.5	22	499	-	152	54
		gas	792 MCF	850	< 1	-	< 1	34
	Cherokee #4	Coal .53% S 8.0% A	112	22	1130	-	344	123
		gas	2420 MCF	850	< 1	-	< 1	103
Metro Denver 036 (Denver)	*Zuni #1 115.3	Oil 1.0% S 0.% A	17,600,000 gallons	150 per 1000 gallons	1270	-	11	171
		gas	1450 MCF	848	< 1	-	2	80
	Zuni #2	Coal .37% S 5.8% A	55	18	2	-	37	50
Metro Denver 036 (Denver)	Arapahoa #1 250.5	Coal .26% S 5.0% A	14.7	10	72	-	98	8.1
		gas	1840 MCF	848	< 1	-	2	86
	Arapahoa #2	Coal .26% S 7.2% A	83.2	10	411	-	36	46
		gas	1,620 MCF	848	< 1	-	< 1	76
	Arapahoa #3	Coal .26% S 7.2% A	70	10	345	-	32	39
		gas	4470 MCF	848	< 1		< 1	208
	Arapahoa #4	Coal .26% 7.2% A	4.26	10	892	-	120	2
		gas	9160 MCF	848	117	-	32	388

[a]emissions in Data Bank as of June 1974.

*FEA considering Zuni plant to go all coal

C-1 Ċ Colorado Power Plant Evaluation[a]

AQCR/Number/County	Plant/ Capacity	Fuel Type	Fuel Amount 10^3ton/yr	Fuel Heat Input 10^6BTU H	Emissions Tons/yr SO_2 Exist	SO_2 Allow	TSP Exist	TSP Allow
Pawnee 037 (Larimer)	Ft. Collins #1 8.0	Coal 1.0% S 15.1% A	.61	19	12	-	78	1.2
		gas	40 MCF	840	<1	-	<1	3.4
	Ft. Collins #2	Coal 1.0% S 15.1% A	.61	19	12	-	78	1.2
		gas	40 MCF	840	<1	-	<1	3.4
	Ft. Collins #3	Coal 1.0% S 15.1% A	.97	19	19	-	125	1.7
		gas	78 MCF	840	<1	-	<1	5.9
	Ft. Collins #4	Coal 1.0% S 15.1% A	1.71	19	32	-	219	2.6
		gas	139 MCF	840	<1	-	<1	9.3

[a]emissions in Data Bank as of June 1974.

C-1 D Colorado Power Plant Evaluation[a]

AQCR/Number/County	Plant/ Capacity	Fuel Type	Fuel Amount 10^3ton/yr	Fuel Heat Input 10^6BTU H	Emissions Tons/yr SO_2 Exist	SO_2 Allow	TSP Exist	TSP Allow
San Isabel 038 (Fremont)	Clark #1 38.5	Coal .70% S 15.7% A	26.9	20	357	-	192	35
		gas	871 MCF	981	< 1	-	< 1	56
	Clark #2	Coal .70% S 15.7% A	17.9	20	238	-	128	23
		gas	580 MCF	981	< 1	-	< 1	37
San Isabel 038 (El Paso)	Drake #1 150	Oil 1.02% S 0% A	-	149	0	-	0	0
	Drake #2	Coal .82% S 12.2% A	39.4	21	614	-	500	
		gas	2270 MCF	840	< 1	-	3	95
	Drake #3	Coal .62% S 12.2% A	60	21	1250	-	63	84
		gas	4600 MCF	840	1	-	< 1	193
	Drake #4	Coal 70% S 14.0% A	494	9300	0	5420	0	459
San Isabel (038) (El Paso)	Birdsall #1 62.5	Oil 1.0% S	1,900,000 gallons	148 per 1000 gals	149	-	8	18
		gas	886 MCF	840	< 1	-	7	48
	Birdsall #2	Oil 1.0% S	1,900,000 gallons	148 per 1000 gal	149	-	8	18
		gas	886 MCF	840	<1	-	7	48
	Birdsall #3	Oil 1.0% S	2,540,000 gallons	148 per 1000 gal.	199	-	10	23
		gas	1180 MCF	840	<1	-	9	59
San Isabel 038 (Pueblo)	Pueblo #1 30.0	Coal .70% S 15.0% A	1.47	20	20	-	13	1.9
		oil 3% S 0%	176000 gallons	142 per 1000 gals	4	-	< 1	16
		gas	2140 MCF	846	< 1	-	< 1	108
	Pueblo #2	Coal .70% S 15% A	.90	20	12	-	2	1.3
		gas	866 MCF	846	< 1	-	<1	55
San Luis 039 (Alamosa)	Alamosa 18.9	Oil 0.5% S	3,840,000 gallons	135 per 1000 gals.	151	-	15	31
		gas	365 MCF	840	< 1	-	3	18
Yampa 040	Hayden #1 163.2	Coal .47% S 10.4% A	540.5	1371	6220	-	1643	?

[a]emissions from Data Bank as of June 1974.

Table C-2. Power Plant Projected Development[a] 1975-1985

AQCR	County	Owner	Plant	MW	Estimated Emissions NSPS		
					TSP	SO_2	NO_x
038 San Isabel	El Paso	Dept. Pub. Util.	Martin Drake #7	127	450	5400	3150
	El Paso	Dept. Pub. Util.	na	180	637	7654	4464
	El Paso	Dept. Pub. Util.	na	200	708	8504	4960
	Pueblo	Pub. Ser. Co.	Comanche #2	350	1208	14882	8680
040 Yampa	Moffat	Colo.Ute. Ass'n.	Craig #1	350	1208	14882	8680
			Craig #2	350	1208	14882	8680
	Routt	Colo.Ute. Ass'n.	Hayden #2	250	885	10630	6200
Unassigned[b]		Pub. Ser. Co.	Unassigned	500	1770	21260	12400
Unassigned[b]		Pub. Ser. Co.	Unassigned	500	1770	21260	12400
Unassigned[b]		Pub. Ser. Co.	Unassigned	500	1770	21260	12400

[a]All plants are coal fired.
[b]Unassigned power plants.

Table C-3. Energy Development Power Plants

AQCR	Owner	Type	Produces (Generates)	Emissions, NSPS		
				TSP	SO_2	NO_x
036 Metro Denver	Tri State	Coal Gassification	250 MCF per day	Na	Na	Na
Oil Shale Development (50,000 BPD Plant)[a]						
035 Grand Mesa	-	Coal/Process Gas	200 MW	708	8504	4960
040 Yampa	-	Coal/Process Gas	200 MW	708	8504	4960

[a]Estimates provided by EPA, Region VIII.

Table C-4. AP-42 Power Generation Emission Factors

Fuel	Particulates Lbs/Ton	Particulates Lbs/10^6 Btu	SO_2 Lbs/Ton	SO_2 Lbs/10^6 Btu	Hydrocarbons Lbs/Ton	Hydrocarbons Lbs/10^6 Btu	NO_x (as NO_2) Lbs/Ton	NO_x (as NO_2) Lbs/10^6 Btu
Coal[1] (Bit.)								
General	160	7.4			0.3	0.013	18	0.78
Wetbottom 10% A	130	7.0					30	1.3
Cyclone	20	0.9					55	2.4
1% S	Same	Same	38	1.65	0.3	0.13	Same	Same
2% S	as	as	76	3.3			as	as
3% S	Above	Above	114	5.0			Above	Above
Oil[2]	Lb/10^3 Gal		Lb/10^3 Gal		Lb/10^3 Gal		Lb/10^3 Gal	
0.5% S	8	0.058	79	0.56	2	.014	105	0.75
1.0% S	8	.058	157	1.12	2	.014	105	0.75
2.0% S	8	.058	314	2.24	2	.014	105	0.75
Gas[3] (.3 lbs S/ 10^6 Ft^3)	Lb/10^6Ft^3		Lb/10^6Ft^3		Lb/10^6Ft^3		Lb/10^6Ft^3	
	15	.015	0.57	.00057	1	.001	600	0.60

(1) Coal 23 x 10^6 Btu/Ton

(2) Oil 140 x 10^3 Btu/Gal

(3) Gas 1000 Btu/Ft^3

APPENDIX D

The D-1 Tables in this appendix list individual industrial/commercial/institutional sources of particulates and SO_2 emissions which might show fuel switching potential. The sources are from a NEDS rank order emissions listing. At the top of D-1 Tables is the percent of total emissions (both fuel and non-fuel sources) accounted for in the AQCR, since not all sources could be listed in this report. It should be cautioned that the percent emissions accounted for is different than the "% of fuel use accounted for." It is possible that several potential fuel switch sources could be overlooked by the cutoff point on the emissions (i.e., a reasonable sized natural gas used may emit below our cutoff point in the NEDS rank order list).

Table D-1. Major Industrial Fuel Combustion Sources with Multi-Fuel Capability

AQCR	County	Source	Boiler Capacity 10^6 BTU/Hr	Fuel Type	Annual Amount	Emissions TSP Exist	TSP Allow[a]	SO_2 Exist	SO_2 Allow[b]	
035 Grand Mesa	Montrose	#5	Na	Oil .5% S	800,000 gal.	9	-	31	-	
				Gas	394 MCF	4	-	<1	-	
036 Metro Denver	Boulder	#2	Na	Coal .2%S 8.3#A	46,200	489	-	176	-	85% TSP Control
				Oil 1% S	160,000 gal.	<1	-	13	-	
				Gas	286 MCF	<1	-	<1	-	
	Boulder	#11	Na	Oil 1.1% S	70,000 gal.	<1	-	6	-	
				Gas	382 MCF	3	-	<1	-	
	Arapahoe	#11	80	Oil 0.6%S	136,000 gal.	1	1.9	6	-	
				Gas	85 MCF	<1	5.3	<1	-	
	Adams	#11	Na	Oil 1.1%S	260,000 gal.	3	-	22	-	
				Gas	1,910 MCF	17		<1		
	Adams	#24 (01)	110	Oil .62% S	88,000 gal.	1	1.2	4	-	
				Gas	150 MCF	1	9.3	<1	-	
	Adams	#24 (02)	110	Oil .62% S	88,000 gal.	1	1.2	4	-	
				Gas	150 MCF	1	9.3	<1	-	
	Adams	#24 (03)	110	Oil .62% S	88,000 gal.	1	1.2	4	-	
				Gas	150 MCF	1	9.3	<1	-	
	Adams	#24 (04)	110	Oil .62% S	88,000 gal.	1	1.2	4	-	
				Gas	150 MCF	1	9.3	<1	-	

[a]Information insufficient for calculation.
[b]SO_2 emission regulations for existing sources withdrawn.

Table D-1. Major Industrial Fuel Combustion Sources with Multi-Fuel Capability (Cont'd)

AQCR	County	Source	Boiler Capacity 10^6 BTU/Hr	Fuel Type	Annual Amount	Emissions TSP Exist	TSP Allow[a]	SO_2 Exist	SO_2 Allow[b]
036 Metro Denver	Adams	#30	55	Oil .6 % S	384,000 gal.	4	4.6	18	-
				Gas	431 MCF	4	.04	<1	-
	Denver	#12	680	Oil 1.0% S	538,000 gal.	2	3.6	42	-
				Oil .6% S	2,510,000 gal.	10	19888	108	-
				Gas	2,000 MCF	15	83	<1	-
	Denver	#19	5	Coal .5% S 15.1%A	75 Tons	7	.1	<1	-
				Gas	20 MCF	<1	2.5	<1	-
	Denver	#21	Na	Oil .6% S	818,000 gal.	9	-	39	-
				Gas	3,600 MCF	34	-	1	-
	Denver	#28	600	Oil .6% S	266,000 gal.	2	2.5	11	-
				Gas	277 MCF	3	11.5	<1	-
	Denver	#42	250	Oil .6% S	187,000 gal.	1	2.1	8	
				Gas	762 MCF	7	38	<1	-
	Jefferson	#7	450	Oil 1.0%S	312,000 gal.	4	2.1	24	-
				Gas	905 MCF	8	.1	<1	-
	Jefferson	#8 (01)	30	Coal 1.0%S 12.2%A	4000 Tons	317	7.6	76	-
				Oil .6%S	216,000 gal.	2	3.1	9	-
				Gas	166 MCF	2	13.8	<1	-

[a]Information insufficient for calculation.

[b]SO_2 emission regulations for existing sources withdrawn.

Table D-1. Major Industrial Fuel Combustion Sources with Multi-Fuel Capability (Cont'd)

AQCR	County	Source	Boiler Capacity 10^6 BTU/Hr	Fuel Type	Annual Amount	Emissions TSP Exist	TSP Allow[a]	SO_2 Exist	SO_2 Allow[b]
036 Metro Denver	Jefferson	#8 (02)	30	Oil .6% S	216,000 gal.	2	3.1	9	-
				Gas	166 MCF	2	13.8	<1	-
	Jefferson	#8 (03)	30	Oil .6%S	216,000 gal.	2	3.1	9	-
				Gas	166 MCF	2	13.8	<1	-
	Jefferson	#8 (04)	30	Gas	30 MCF	<1	.01	<1	-
	Jefferson	#20 (01)	250	Gas	744 MCF	7	37	<1	-
	Jefferson	#20 (02)	250	Oil .25%S	780,000 gal.	6	6.6	14	-
				Gas	744 MCF	7	37	<1	-
	Jefferson	#20 (03)	250	Oil .25%S	780,000 gal.	6	6.6	14	-
				Gas	744 MCF	7	37	<1	-
	Jefferson	#20 (04)	505	Oil .25%S	1,560,000 gal.	12	11	28	-
				Gas	1490 MCF	13	63	<1	-
037 Pawnee	Weld	#3	250	Oil 1.0%S	1,550,000 gal.	18	12.6	122	-
				Gas	238 MCF	2	12	<1	-
	Larimer	#6 (01)	210	Oil .75%S	1,010,000 gal.	12	7.9	59	-
				Gas	710 MCF	6	36	<1	-
		#6 (02)	120	Oil .75%S	500,000 gal.	6	3.6	29	-
				Gas	354 MCF	3	16	<1	-

[a]Information insufficient for calculation.

[b]SO_2 emission regulations for existing sources withdrawn.

Table D-1. Major Industrial Fuel Combustion Sources with Multi-Fuel Capability (Cont'd)

AQCR	County	Source	Boiler Capacity 10^6 BTU/Hr	Fuel Type	Annual Amount	Emissions TSP Exist	TSP Allow[a]	SO_2 Exist	SO_2 Allow[b]
038 San Isabel	Pueblo	#1	4540	Oil .60%S	1,050,000 gal.	12	7.5	50	-
				Gas	10,200 MCF	92	428	3	-
				Process Gas	71,200 MCF	534	2990	?	-
	Pueblo	#4	Na	Oil .3% S	80,000 gal.	<1	-	2	-
				Gas	400 MCF	4	-	<1	-
	Lake	#1	80	Oil .7%S	5,000,000 gal.	38	53	249	-
				Gas	346 MCF	3	22	<1	-
	El Paso	#1 (01)	36	Oil.18%S	600,000	5	80	8	-
				Gas	160 MCF	2	12.8	<1	-
	El Paso	#1 (02)	120	Oil .18%S	1,800,000 gal.	14	14	23	-
				Gas	240 MCF	2	11	<1	-
	El Paso	#1 (01)	380	Oil .7%S	2,780,000 gal.	32	21	153	-
				Gas	551 MCF	5	25	<1	-
	El Paso	#1 (02)	60	Oil .7%S	1,150,000 gal.	13	11.6	63	-
				Gas	17 MCF	<1	1.1	<1	-

[a]Information insufficient for calculation.

[b]SO_2 emission regulations for existing sources withdrawn.

APPENDIX E

The state of Colorado was found to have no area sources which could be evaluated within the context of Section 4 of ESECA.

APPENDIX F
IMPACT OF FUEL SWITCHING

The candidate sources for fuel switching identified in Appendices C and D were evaluated to determine the potential effect on emission and to estimate the potential for relaxation of regulations. The percentage of coal utilized was estimated by translating all fuel usage into total annual heat input and directly proportioning on the basis of the percent of annual heat input contributed by each fuel type. Table F-1 presents the power plant present and potential emissions based on 100% coal utilization with present control equipment.

Table F-1. Emissions Resulting from Fuel Switch to 100% Coal for Power Plants with Dual Fuel Capability

AQCR	Source	Present Emissions[a] TSP	Present Emissions[a] SO_2	% Coal	% Gas	% Oil	% Full Coal Utilization	Emissions after Fuel Switch TSP Emission	TSP Allow	SO_2 Emission	SO_2 Allow[b]
036	Valmont #1	6362	5502	60	40	-	167	10605	674	9185	-
	#2	17	3	1	99	-	10000	1500	13	300	-
	#3	1209	317	33	67	-	303	70	70	961	-
	Cherokee #1	189	373	55	45	-	182	344	74	679	-
	#2	63	373	55	45	-	182	115	74	679	-
	#3	152	499	62	38	-	162	246	88	808	-
	#4	344	1130	55	45	-	182	626	226	2057	-
	Arapahoe #1	100	72	9	91	-	1111	1089	94	989	-
	#2	36	411	38	62	-	263	95	122	1752	-
	#3	32	346	16	84	-	625	200	247	1806	-
	#4	152	1009	1	99	-	10000	12000	390	3800	-
037	Ft.Collins #1	78	12	26	74	-	385	300	4.6	46	-
	#2	78	12	26	74	-	385	300	4.6	46	-
	#3	125	19	22	78	-	455	569	7.6	86	-
	#4	219	32	22	78	-	455	996	11.9	146	-
038	Clark #1	192	357	39	61	-	256	491	91	914	-
	#2	128	238	39	61	-	256	328	60	609	-
	Drake #2	503	614	30	70	-	333	1665	136	2045	-
	#3	63	1251	30	70	-	333	210	277	4162	-
	Pueblo #1	14	24	2	97	1	5000	650	126	100	-
	#2	2	12	2	98	-	5000	100	56	600	-

[a]Based on total emissions from each fuel operation.

[b]SO_2 emission regulations for existing sources withdrawn.

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